

# PATENT SPECIFICATION

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## PROVISIONAL SPECIFICATION

### Improvements in Hose-End Fittings and in Methods of Applying them to the Hose

I, EDWARD CHARLES CARLING, British Subject, of 96, Fairholt Road, Stoke Newington, London, N.16, do hereby declare the nature of this invention to be as follows:—

This invention relates to hose-end fittings and to methods of applying such fittings to the ends of hose.

Broadly stated one feature of the present invention consists in employing a hose-end cap which is formed of a mouldable material such as thermo-plastic material including a thermo-setting plastic material.

Another feature of the invention consists in applying such a hose-end cap by the method which consists in subjecting the mouldable material when positioned about the hose-end, to heat and to pressure within a mould which limits the expansion of the material under pressure and causes it to flow into intimate and secure engagement with the material of the hose.

In general, the hose-end fitting would also include as is common practice an insert component which is inserted in the bore of the hose, this insert usually being formed to provide one part of a coupling; in this general type of end fitting the mould would be formed to cause the mouldable material to flow also into interlocking engagement with the insert, and the pressure employed in the moulding operation would be such as not only to compel the material to take the mould form but actually to cause the hose material to be contracted radially on to the insert to form a secure bond therewith.

An arrangement in which an insert is used will now be described in greater detail to illustrate both the method and the finished hose-end fitting of this invention.

The die comprises two main parts one having a central opening providing a

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ring die, this part forming the outer surface of the cap and being for this purpose dimensioned to receive the end of the hose with an insert piece fitted in its bore. The insert extends beyond the ring die and the face of the die beyond which the insert extends is closed by a second die part or plate which co-operates with the insert itself to complete the closure of this side of the ring die; in addition the extremity of the hose terminates short of the plate. The other or open side of the ring die forms an entry for a hollow ram which fits over the hose and is advanced under pressure into the ring die.

The mouldable material is contained in the space between on the one hand, the ring die and the die plate, and on the other hand, the outer surface of the hose-end and the exposed part of the insert. Hence, the ring die being heated, preferably electrically, as the ram moves into the die, the mouldable material is caused to flow and, being constrained by the ring and the die plate from expansion the material is forced into secure engagement with the outer surface of the hose-end; in addition, the material is caused to flow over the end face of the hose thus sealing this face of the hose and into intimate contact with that part of the insert which is exposed between the end of the hose and the lower face of the die plate. In order to effect a secure bond between the mouldable material and the insert, the exposed part of the insert can be roughened, serrated or otherwise formed to afford a key in which the material flows and becomes bonded.

By employing a pressure which is greater than that necessary to force the mouldable material into firm engagement with the hose, the hose is contracted radially and of course becomes firmly secured to the insert, which may be keyed or roughened to increase the grip.

An important consideration consists in

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preventing so far as is possible any "spewing" of the mouldable material through joints between the mould parts; for this reason, the ring die would preferably be formed in one piece (i.e. it should not be a divided die) and the joint between the die plate and the insert is sealed by a thin metal seal such as a copper washer; to render this washer effective the insert is formed with a shoulder up to which the washer is threaded before the insert is fitted in the hose end while the die plate seats against the outer surface of the shoulder and below a second layer shoulder on the insert; hence the washer thus laps over the joint between the die plate and insert. This washer, being thin, is caused by the flow of mouldable material to be pressed firmly against the plate and the smaller shoulder to form an effective seal preventing "spewing" through the joint.

For the purpose of enabling the die plate to be removed after the forming process, it is necessarily of divided form and it is to be observed that the washer seals also the joint at the meeting line of the two parts.

In some cases it may be found convenient to employ a divided or "split" main mould; indeed it may be found desirable to employ a single mould which is turned in at one end to function as does the die plate in the construction already described and in such a case the mould would have to be a split one. In either case, the longitudinal joint could similarly be sealed by copper strips which could be formed by ears or extensions of the washer referred to.

It is equally important to prevent spewing of the mouldable material past the hollow plunger where it moves over the outer surface of the hose; however there are considerable variations in the actual diameter of different samples of hose of the same nominal diameter. To provide for this there is provided for fitting over the hose beyond the position to which the insert extends into it, a split

sleeve over which the hollow ram slides; as the ram passes on to the sleeve, it forces the two parts of the sleeve close together, the hose itself being contracted to afford the requisite accommodation and thus the ram maintains a snug sliding fit on the sleeve and so prevents spewing at this zone. The end of this sleeve may be extended up slightly into the ring die and there be formed with a rounded end which forms part of the die assembly and causes the moulded end cap to have a bevelled lower mouth to prevent cutting of the hose when this flexes.

This sleeve will also operate to hold the hose end tight against displacement from the insert and so prevent the hose-end from being forced back as the mouldable material is caused to flow by the applied pressure; the sleeve can be positioned by an abutment.

The mouldable material can be applied in readiness for moulding either in the form of a semi-solid or in the form of a powder.

In order to key the cap to be keyed to the hose, the outer surface of the hose can be grooved in one or more places, the mouldable material being forced into the groove during the moulding operation.

The invention can be applied to any type of hose, i.e. the hose can be of the usual rubber or rubber-like material whether reinforced or otherwise and, where reinforced, reinforced by embedded or external reinforcement of metal or fabric. It could equally be applied to the so-called metallic flexible hose, the plastic material in this case embedding itself in the turns of the metal of the hose; when metal hose is to be dealt with, a sealing layer of rubber, felt, asbestos or other similar material can be fitted over its end prior to the moulding operation.

Dated this 3rd day of October, 1946.

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London, W.C.1.

## COMPLETE SPECIFICATION

### Improvements in Hose-End Fittings and in Methods of Applying them to the Hose

I, EDWARD CHARLES CARLING, British Subject, of Hillsdon House, Alderbury, Wiltshire (formerly of 96, Fairholt Road, Stoke Newington, London, N.16), do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the applying to a hose-end of hose-end fittings which comprise an insert to be fitted within the bore of the hose and a ferrule to be fitted over the end of the hose.

The invention is concerned with the application of such fittings to flexible hose of rubber or like resilient material.

The invention utilises the method

which consists in inserting a hose-end with its insert in a mould having a ferrule-forming cavity which receives a mouldable material and subjecting that material to heat and/or pressure to cause it to flow into engagement with the walls of the cavity and with the hose-end and its insert.

Now, according to the present invention, which is concerned only with hose formed of rubber or rubber-like material, the mouldable material is subjected to such pressure in the moulding or ferrule-forming operation that the hose-end is contracted by the material radially on to the insert to form a secure bond therewith, while at the same time the ferrule is formed and bonded to the hose and to the insert.

The insert would as is usual be formed to provide one part of a coupling by which the hose to which the insert is fitted can be connected to the other part of the coupling.

Reference will now be made to the accompanying drawing which illustrates both a mould for carrying out the method of this invention and a hose-end with a hose-end fitting applied to it by that method: in the drawing figure 1 is a vertical sectional elevation of the mould with a hose applied to it, figure 2 is a plan view of the mould and figure 3 is a sectional elevation of the finished hose-end.

Referring firstly to figures 1 and 2, the die or mould shown therein comprises two main parts 1, 2, the part 1 having a central opening 3 providing a ring die, this opening being dimensioned to form the outer surface of a cylindrical ferrule and receiving the end of the rubber or like hose 4 with an insert piece 5 fitted in its bore. The insert 5 extends beyond the ring die 1 and the face of the die 1 beyond which the insert extends is closed by the second die part 2 in the form of a plate which co-operates with the insert 5 itself to complete the closure of this side of the ring die; in addition the extremity of the hose 4 terminates short of the plate 2. The other or open side of the cavity 3 of the ring die 1 forms an entry for a hollow ram 6 which fits over the hose 2 and is advanced under pressure into the cavity 3.

The mouldable material 7 indicated by dots is contained in the space between on the one hand, the opening 3 in the ring die and the die plate 2, and on the other hand, the outer surface of the hose-end and the exposed part 8 on the insert 5. The ring die is heated, preferably by electrical heating elements 9 and hence as the ram 6 moves into the die opening

3, the mouldable material is caused to flow and, being constrained by the ring die and by the die plate 2 from expansion, the material is formed into secure engagement with the outer surface of the hose-end 4 with the result that this material takes the shape shown in figure 3 which illustrates the hose 4 with its ferrule 17 removed from the mould. The material 17 has been caused to flow over the end face of the hose 4 thus sealing this face and into intimate contact with the part 8 of the insert 5, this part being exposed between the end of the hose 4 and the lower face of the die plate 2. In order to effect a secure bond between the ferrule 17 and the insert 5, the exposed part 8 can as shown be roughened, serrated or otherwise formed to afford a key in which the material flows and becomes bonded.

By applying through the ram 6 a pressure which is greater than that necessary to force the mouldable material 7 into firm engagement with the hose 4, the hose being of rubber or rubber-like material, is contracted radially and of course becomes firmly secured to the stem 10 of the insert, this stem being keyed or roughened to increase the grip.

An important consideration consists in preventing so far as is possible any "spewing" of the mouldable material through joints between the mould parts 1, 2; for this reason, the ring die would preferably be formed in one piece (i.e. it should not be divided die) and the joint between the die plate 2 and the insert 5 is sealed by a thin metal seal 11 such as a copper washer; to render this washer effective the insert is formed with a shoulder 12 up to which the washer 11 is threaded before the insert 5 is fitted in the hose-end 4 while the die plate 2 seats flush with the shoulder 12 and below a second shoulder 13 on the insert 5; the washer 11 thus extends over the joint between the die plate 2 and insert 5 and this washer, being thin, is caused by the flow of mouldable material to be pressed firmly against the plate 2 and the shoulder 12 to form an effective seal preventing "spewing" through the joint.

For the purpose of enabling the die plate 2 to be removed after the forming process, it is necessarily of divided form and it is to be observed that the washer 11 seals also the joint at the meeting line of the two parts.

In some cases it may be found convenient to employ as divided or "split" main mould 1; indeed it may be found desirable to employ a single mould which is turned in at one end to function as does the die plate 2 in the construction already

described and in such a case the mould would have to be a split one. In either case, the longitudinal joint could similarly be sealed by copper strips which could be formed by ears or extensions of washer referred to.

It is important to prevent spewing of the mouldable material past the hollow plunger 6 where it moves over the outer surface of the hose 4; however there are considerable variations in the actual diameter of different samples of hose of the same nominal diameter. To avoid this difficulty there is provided for fitting over the hose 4 beyond the position to which the stem 10 of the insert extends a split sleeve adaptor 14 over which the hollow ram 6 slides; as the ram passes on to the sleeve, it forces the two parts of the sleeve close together, the hose itself being contracted to afford the requisite accommodation and thus the ram 6 maintains a snug sliding fit on the sleeve and so prevents spewing at this zone. The end of this sleeve 14 may be extended up slightly into the ring die 1 and there be formed with a rounded end which forms part of the die assembly to cause the moulded end cap to have a bevelled lower mouth preventing cutting of the hose when this flexes.

This sleeve 14 will also operate to hold the hose-end tight against displacement from the insert 5 and so will prevent the hose-end from being forced back as the mouldable material is caused to flow by the applied pressure; the sleeve itself can be positioned by an abutment 15 which can be constituted by a work-table through an opening in which the end of the hose is passed to have the sleeve 14 and the ram 6 fitted to it before the fitting of the insert 5: the ram 6 would be moved in any convenient manner upwardly with respect to the table 15 and pressure would be applied to the mould assembly to hold it against the moulding pressure of the ram 6. In order to hold the insert 5 itself against displacement during the moulding process, the body 1 of the die can have a pressure bar 16 against which the outer end of the insert is located and which absorbs the pressure tending to "blow-out" the plate 2 and with it the insert 5.

The mouldable material can be applied in readiness for moulding either in the form of a semi-solid or in the form of a powder.

In order to key the cap 17 to the hose 4, the outer surface of the hose can be grooved in one or more places, of which one is indicated at 18, the mouldable material being forced into the groove during the moulding operation.

The invention can be applied to hose of the usual rubber or rubber-like material whether or not reinforced by a flexible plait reinforcement 19 of metal or fabric plait being indicated at 19.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Providing a flexible hose consisting of rubber or rubber-like material which is deformable radially with an insert and a ferrule which together form a hose-end fitting, the method which consists in fitting the insert within the bore of the rubber hose itself, in inserting the end of the hose and the insert in a ferrule-shaping mould and in subjecting mouldable material within the mould to such pressure that the hose-end is contracted by the material on to the insert while at the same time the ferrule is formed and bonded to the insert and the hose-end.

2. In the carrying out of the method claimed in claim 1 by the employment of a mould formed of separable parts, sealing the joints between the parts by a thin metal seal which is laid over the joints to be sealed before the mould is filled.

3. The method claimed in claim 1 or 2 and which further consists in fitting to the end portion of the hose prior to its insertion into the mould an annular ram to enter the mould-cavity about the hose end, the ram being displaced into the cavity to apply pressure to moulding material therein.

4. The method claimed in claim 3 and which further consists in fitting to the hose a slit adapter on which the ram is slidable.

5. For carrying out the method claimed in claim 3 a mould having a ferrule-forming cavity to receive the end of the hose and the mouldable material and an annular ram dimensioned to slide over the hose and to enter the cavity to cause the mouldable material therein to flow.

6. Apparatus as claimed in claim 5 and having an adaptor to fit over the hose-end and to provide a sliding surface for the ram.

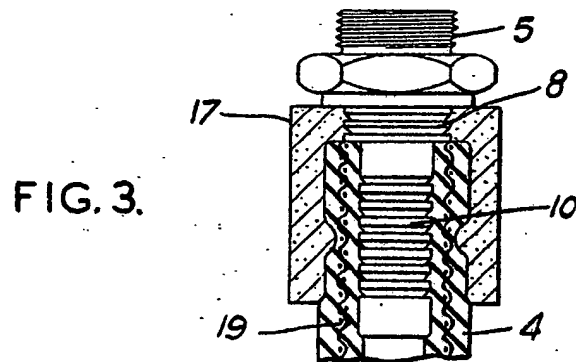
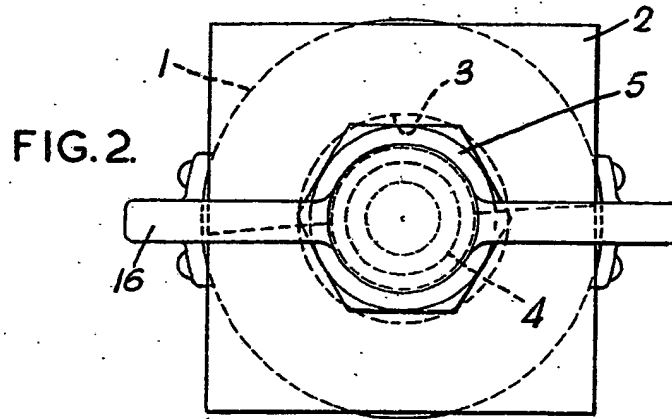
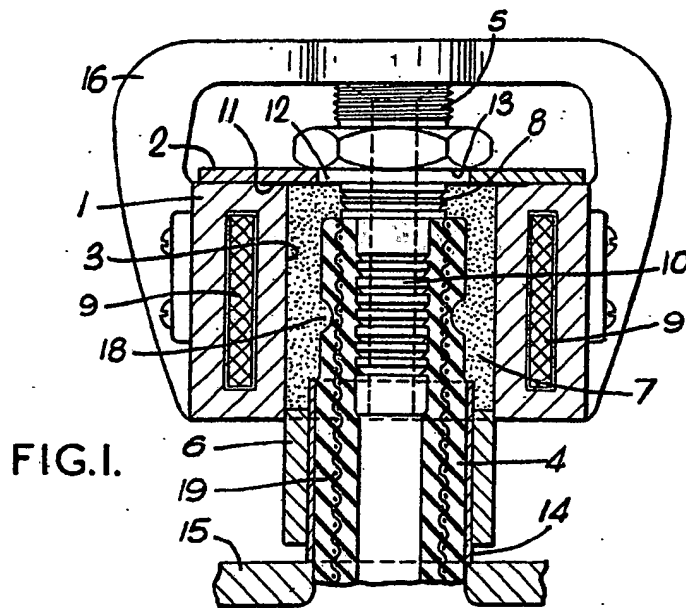
7. To secure a hose-end fitting to a rubber or like hose, apparatus substantially as described with reference to the accompanying drawing.

8. A hose having a hose-end whenever fitted by the method claimed in claims 1-4.

Dated this 3rd day of November, 1947.

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[This Drawing is a reproduction of the Original on a reduced scale.]



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